

# PATENT ABSTRACTS OF JAPAN

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(54) RING LINING MATERIAL FOR DENTAL DIE

(57)Abstract:

PURPOSE: To provide a ring lining material for dental casting by achieving proper softness, buffering action and strength at a room temperature and during a heating though containing no asbestos to allow no defect in casting such as cast burring in a cast body, and moreover, make the material highly compatible with an omitted base part of a cast restoration.

CONSTITUTION: This material is mainly composed of inorganic fibers and glass fibers and an inorganic powder having heat resistance higher than 1,000°C and then they are bound by an inorganic binder and an organic binder to form a sheet.

## LEGAL STATUS

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CLAIMS

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[Claim(s)]

[Claim 1] The ring liner for dental casting which uses as a principal component the inorganic fiber, the glass fiber, and the inorganic fine particles which have the thermal resistance of 1000 degrees C or more, and is characterized by binding with an inorganic binder and an organic binder, and fabricating and growing into a sheet.

[Claim 2] The ring liner for dental casting according to claim 1 by which alumina sol and/or a silica sol, and this organic binder are constituted for this inorganic binder from a synthetic-resin emulsion and a denaturation silicon resin emulsion.

[Claim 3] The manufacture approach of the ring liner for dental casting characterized by mixing an inorganic binder and an organic binder to what carried out disaggregation mixing by combination and underwater by using as a principal component the inorganic fiber, the glass fiber, and the inorganic fine particles which have the thermal resistance of 1000 degrees C or more, milling paper, dehydrating and drying in predetermined thickness, and fabricating and growing into a sheet.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the ring liner for dental casting which carries out the lining inside a casting ring and which is used for it in dental casting.

[0002]

[Description of the Prior Art] The strip-of-paper-like ring liner used for dental casting does not control the setting expansion or heating expansion of the mold material for dentistry that the contraction produced in case a molten metal is cast and it is cooled by even the room temperature, in order to fit a casting restoration object to the parenchymatous defect part in the oral cavity correctly should be compensated, but it is used for it as a cushioning material, carrying out the lining of it inside the ring for dental casting. The ring liner used for such the purpose is called the shock absorbing material for casting, or the relining material for casting in dentistry.

[0003] Conventionally, the asbestos paper in which a ring liner uses asbestos as a principal component is used, and the ceramic paper which recently uses ceramic fiber as a principal component in part came to be used.

[0004]

[Problem(s) to be Solved by the Invention] In U.S. inside, use of the asbestos to a building material is forbidden by the thing that asbestos has carcinogenic, and regulating also in Japan etc. has become a social problem in recent years.

Requests into the ingredient which replaces asbestos also in dentistry have been mounting.

[0005] As an object for an alternative of the ring liner which used asbestos as the principal component on the other hand, the ring liner of the ceramic fiber system which used the fiber of the quality of alumina silicate as the principal component is marketed. The ring liner of this ceramic fiber system uses ceramic fiber as a principal component, and is using synthetic resin or natural pulp, such as acrylic resin, as the binder.

[0006] Although such a ring liner of a ceramic fiber system has sufficient cushioning properties to use with dentistry, neither the expansion at the time of the coagulation of mold material nor the expansion at the time of heating is controlled, and the ring liner by which it was heated in the casting ring collapses in the shape of cotton and has a casting ring, the condition of ring loess casting is shown [ whether it is also \*\* or ]. That is, a crack occurs easily in mold and a casting defect is generated. This casting defect has a bad influence also on the compatibility to a deficit bridge abutment part.

[0007] That is, when restoring the gear tooth (cavity) which fell ill by the caries with dentistry, and the gear tooth which fell out, an alloy is cast, and an inlay, crown, etc. are created. The precision casting called a lost wax process on the occasion of casting is used. When inaccurate, it is because a patient's gear tooth cannot be certainly equipped with the inlay or crown which were cast.

[0008] However, since it will contract about 1.5 to 2.3% by the time it is cooled by ordinary temperature after solidifying a dental alloy in mold also with a lost wax process, mold material needs to carry out only expansion which compensates contraction of a casting alloy during coagulation and heating. The mold at the time of casting the molten metal of an alloy needs to have oversized from the dimension of a wax pattern about 1.5 to 2.3%, and, for this reason, mold material carries out thermal expansion to setting expansion. Into a casting ring, mold material makes the pattern formed with the wax buried, after solidifying mold material, carries out heating dewaxing within an electric furnace, and forms mold.

[0009] Therefore, the ring liner which absorbs expansion of mold material to the inner skin of a casting ring is prepared. The lining of this ring liner is carried out to the inner skin of a casting ring in the shape of a strip of paper. Therefore, to fit a casting ring, to absorb the expansion at the time of the coagulation of mold material and the expansion at the time of heating, and for the heated ring liner to maintain the shape of a sheet, and not to collapse in the shape of cotton are demanded. Moreover, in order to abolish the variation in expansion by swelling of mold material, water repellence is required for a ring liner so that moisture may not be absorbed.

[0010] However, although what used the above-mentioned ceramic fiber as the principal component, and used synthetic resin or natural pulp as the binder did not control expansion of mold material, the fit nature to casting ring inner skin and the heated ring liner collapsed in the shape of cotton, the crack occurred easily in mold, the moisture of generating or

mold material was absorbed by the ring liner in the casting defect, and it had the problem of the variation in expansion of mold material occur.

[0011]

[Means for Solving the Problem] Without this invention's not containing asbestos at all, but absorbing the moisture of mold material, a strip-of-paper sheet fits casting ring inner skin, and the expansion at the time of the coagulation of mold material and the expansion at the time of heating are absorbed, When the shape of a sheet is maintained, it does not collapse in the shape of cotton and a crack does not occur easily in mold, casting defects, such as a flash, do not generate the heated ring liner on a casting object. And the result of having examined wholeheartedly the ring liner from which the compatibility to the defective bridge abutment part of a casting restoration object also becomes good, The glass component which carries out softening sintering at 400-700 degrees C, and serves as a matrix of ceramic fiber or inorganic fine particles is added to ceramic fiber and the inorganic fine particles which have the thermal resistance of 1000 degrees C or more currently used from the former, When asbestos paper has by using together the inorganic binder which demonstrates adhesive strength at the temperature of 200 degrees C or more which an organic binder pyrolyzes, and the organic binder which demonstrates adhesive strength in ordinary temperature, and [ same ] The ring liner which it has moderate buffer action, and the expansion at the time of mold coagulation and heating is not controlled [ liner ], but it moreover has [ liner ] moderate reinforcement, and does not generate a flash was found out, and this invention was completed.

[0012] That is, moreover the ring liner which this invention added the inorganic binder and the synthetic-resin emulsion at inorganic powder, such as ceramic fiber of the quality of alumina silicate which has the thermal resistance of 1000 degrees C or more, a glass fiber, and alumina powder, and was sheet-ized did not make a casting object generate casting defects, such as a flash, excluding asbestos at all, but its compatibility to a bridge abutment part was also good.

[0013] To the reason there is also no generating of a flash and the good casting restoration object of compatibility is obtained by the ring liner by this invention, in case mold material solidifies first at the time of a room temperature, since it has moderate tensile strength with ceramic fiber, a glass fiber, the moderate cushioning properties by inorganic fine particles, and an organic binder, setting expansion is not controlled.

[0014] Furthermore, in case the pattern which consists the solidified mold of the wax buried in mold or resin is incinerated, thermal expansion of mold is not controlled and a crack does not occur in mold according to the effectiveness of an inorganic binder of moreover having the effectiveness of adhesive strength above 200 degrees C.

[0015] The glass fiber of this invention is softened below 700 degrees C, and although 573 degrees C of heat temperature of transformation of the quartz contained in mold material or the cristobalite aggregate, i.e., a quartz, and 200-300 degrees C of cristobalites show big expansion, the role which gives moderate buffer action and reinforcement to the big expansion by the heat transformation of the aggregate is shown. For example, soda glass, phosphate glass, borate glass, etc. are used.

[0016] Furthermore, if it said, in order that the quartz and Cousteau Bala Ito's heat temperature of transformation which are contained in mold material might show the expansion at about 200-300 degrees C with big 573 degrees C and cristobalite with a quartz, 200 degrees C or less of 200 degrees C or more of things for which it has moderate reinforcement according to the effectiveness of an inorganic binder became possible according to the effectiveness of an organic binder.

[0017] In order not to control expansion of room temperature -200 degree C but to obtain moderate reinforcement, the suitable loadings of acrylic resin or the organic binder of a vinyl-acetate-resin system are 5 - 15 weight section. Moreover, in order not to control expansion of 200 degrees C or more but to obtain moderate reinforcement, the suitable loadings of the inorganic binder of alumina sol or a silica sol system are under 1 - 10 weight section. In under the organic binder 5 weight section and under the inorganic binder 1 weight section, casting defects, such as a flash, occur with the lack of on the strength, and a bad influence is done also to compatibility. More than the organic binder 20 weight section, above the inorganic binder 18 weight section, reinforcement is too large, cushioning properties are lost, expansion of mold is controlled, and compatibility serves as a defect to the bridge abutment part of a casting object. The reason for blending the inorganic fine particles represented by alumina powder is for taking out the feel of asbestos paper, and 10 - 40 weight section is suitable for it.

[0018] In addition, the weight ratio of aluminum<sub>2</sub>O<sub>3</sub>/SiO<sub>2</sub> usually used as an inorganic fiber which has the thermal resistance of 1000 degrees C or more of this invention can use an alumina fiber besides the ceramic fiber of 0.4-0.6, a zirconia fiber, milt fiber, and a potassium titanate fiber, and suitable loadings are 30 - 60 weight section. Moreover, the suitable loadings of a glass fiber are 10 - 50 weight section. Moreover, mixing the natural pulp currently used from the former also raises the workability of paper making.

[0019] Furthermore, in order to control the absorptivity of a ring liner, by adding denaturation silicon resin to some organic binders, the repeatability of expansion of a casting object became good and the good result was obtained to the compatibility to the bridge abutment section.

[0020] Furthermore, although there were the beater size method and the sinking-in approach as the adhesion approach of a

binder, and the difference did not have both in the effectiveness as a ring liner, former one was excellent about the workability of wearing to a casting ring. That is, since the migration of resin did not happen but ring lining paper was flexibly finished when a binder is made to adhere by the beater size method, there is no crease at the time of wearing to a ring, and it was able to equip smoothly.

[0021]

[Example] An example explains this invention concretely below.

The example 1 - 3 ceramic fiber (Nippon Steel chemistry SC-1260R) 35 weight section, the aluminum powder 25 weight section, the glass fiber 25 weight section, and the kraft pulp (NBXP) 15 weight section are disaggregated underwater. The silica sol 2.5 weight section (solid content), acrylic resin (Toagosei PDLA-160WR) 5 - 15 weight sections (solid content), and the denaturation silicone emulsion 1 weight section (active principle) were added to this, and the polymer coagulant was added further, and by the usual approach, paper making was carried out, it dried, and the 0.7mm sheet was obtained. (G C company make, trade name new casting liner)

[0022] The example 4 - 6 ceramic fiber 50 weight section, the alumina powder 25 weight section, and the glass fiber 25 weight section are disaggregated underwater. this -- alumina sol 1 - 10 weight sections (solid content), the vinyl-acetate-resin 10 weight section, and the denaturation silicone emulsion 1 weight section (active principle) -- adding -- further -- a polymer coagulant -- adding -- the usual approach -- paper making -- it dried and the 0.7mm sheet was obtained. (G C company make, trade name new casting liner)

[0023] After it cut the sheet of 0.7mm thickness in die length of 50mm, and width of face of 25mm and the tensile strength of a ring liner heated it at the time of a room temperature, and 700 degrees C, it cooled to the room temperature and it was measured with the tension tester. After the flash generating trial fixed to the truncated cone the casting ring which stood the ready-made crown mold wax pattern erect in the truncated cone, and carried out the lining of the ring liner and embedded the pattern at mold material, heating incineration was carried out at 700 degrees C, dental gold-silver-palladium alloys (trade-name cast well MC 12: \*\*\*\* dentistry industrial company make) were cast, it cooled to the room temperature, and it was taken out from mold, and observed the existence of weld flash generating visually. In addition, mold material adjusted and used what mixed 30 % of the weight of alpha-hemihydrate plaster of 70 % of the weight and 15 micrometers of mean diameters by the mixing water ratio 0.33 in the coulisse baryta powder end of 10 micrometers of mean diameters.

[0024] the full crown mold and MOD inlay mold whose compatibility is in A.D.A specification No.2 -- using -- a dentistry artisan's connoisseur -- after having produced the wax pattern by the method, casting in the same approach as a flash generating trial and picking out a casting object from mold, it returned to the pattern and gazed at the good of compatibility, and a defect by the degree of a gap with a pattern.

[0025]

[Table 1]

		組 成 (重量部)	リングライニング材の引張強度 kg/25mm幅		跡バリ発生 の有無	適合性
			常 温 時	700℃ 加 熱 後		
実 施 例	1	セラミック繊維 35 アルミナ粉末 25 ガラス繊維 25 クラフトパルプ 15 シリカゾル 2.5 変性シリコン 1 アクリル樹脂 5	1.5	0.5	無	良 好
	2	アクリル樹脂 10 他は1に同じ	3.0	0.4	無	良 好
	3	アクリル樹脂 15 他は1に同じ	4.5	0.3	無	良 好
	4	セラミック繊維 50 アルミナ粉末 25 ガラス繊維 25 アルミナゾル 1 酢ビ 10 変性シリコン 1	2.0	0.3	無	良 好
	5	アルミナゾル 5 他は4に同じ	2.5	1.0	無	良 好
	6	アルミナゾル 10 他は4に同じ	3.0	1.5	無	良 好
比 較 例	1	セラミック繊維 90 碎木パルプ 10	4.0	綿状にくずれ 測定不可能	有	不 良
	2	セラミック繊維 65 アルミナ粉末 20 セミケミカルパルプ 10 SBR 5	4.5	綿状にくずれ 測定不可能	有	不 良

[0026]

[Effect of the Invention] Although the ring liner which used the inorganic binder and the organic binder together does not contain asbestos so that clearly from Table 1, it has moderate flexibility, buffer action, and reinforcement at the time of a room temperature and heating. Casting defects, such as a flash, did not occur on a casting object, but the compatibility to the deficit bridge abutment part of a casting restoration object is also still better, in any [ of an example ] case, the example of a comparison was excelled, and it became clear that the engine performance required of the ring liner for dental casting was improving.

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**TECHNICAL FIELD**

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**PRIOR ART**

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[Description of the Prior Art] The strip-of-paper-like ring liner used for dental casting does not control the setting expansion or heating expansion of the mold material for dentistry that the contraction produced in case a molten metal is cast and it is cooled by even the room temperature, in order to fit a casting restoration object to the parenchymatous defect part in the oral cavity correctly should be compensated, but it is used for it as a cushioning material, carrying out the lining of it inside the ring for dental casting. The ring liner used for such the purpose is called the shock absorbing material for casting, or the relining material for casting in dentistry.

[0003] Conventionally, the asbestos paper in which a ring liner uses asbestos as a principal component is used, and the ceramic paper which recently uses ceramic fiber as a principal component in part came to be used.

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**EFFECT OF THE INVENTION**

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## TECHNICAL PROBLEM

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[0006] Although such a ring liner of a ceramic fiber system has sufficient cushioning properties to use with dentistry, neither the expansion at the time of the coagulation of mold material nor the expansion at the time of heating is controlled, and the ring liner by which it was heated in the casting ring collapses in the shape of cotton and has a casting ring, the condition of ring loess casting is shown [ whether it is also \*\* or ]. That is, a crack occurs easily in mold and a casting defect is generated. This casting defect has a bad influence also on the compatibility to a deficit bridge abutment part.

[0007] That is, when restoring the gear tooth (cavity) which fell ill by the caries with dentistry, and the gear tooth which fell out, an alloy is cast, and an inlay, crown, etc. are created. The precision casting called a lost wax process on the occasion of casting is used. When inaccurate, it is because a patient's gear tooth cannot be certainly equipped with the inlay or crown which were cast.

[0008] However, since it will contract about 1.5 to 2.3% by the time it is cooled by ordinary temperature after solidifying a dental alloy in mold also with a lost wax process, mold material needs to carry out only expansion which compensates contraction of a casting alloy during coagulation and heating. The mold at the time of casting the molten metal of an alloy needs to have oversized from the dimension of a wax pattern about 1.5 to 2.3%, and, for this reason, mold material carries out thermal expansion to setting expansion. Into a casting ring, mold material makes the pattern formed with the wax buried, after solidifying mold material, carries out heating dewaxing within an electric furnace, and forms mold.

[0009] Therefore, the ring liner which absorbs expansion of mold material to the inner skin of a casting ring is prepared. The lining of this ring liner is carried out to the inner skin of a casting ring in the shape of a strip of paper. Therefore, to fit a casting ring, to absorb the expansion at the time of the coagulation of mold material and the expansion at the time of heating, and for the heated ring liner to maintain the shape of a sheet, and not to collapse in the shape of cotton are demanded. Moreover, in order to abolish the variation in expansion by swelling of mold material, water repellence is required for a ring liner so that moisture may not be absorbed.

[0010] However, although what used the above-mentioned ceramic fiber as the principal component, and used synthetic resin or natural pulp as the binder did not control expansion of mold material, the fit nature to casting ring inner skin and the heated ring liner collapsed in the shape of cotton, the crack occurred easily in mold, the moisture of generating or mold material was absorbed by the ring liner in the casting defect, and it had the problem of the variation in expansion of mold material occur.

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**MEANS**

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[Means for Solving the Problem] Without this invention's not containing asbestos at all, but absorbing the moisture of mold material, a strip-of-paper sheet fits casting ring inner skin, and the expansion at the time of the coagulation of mold material and the expansion at the time of heating are absorbed, When the shape of a sheet is maintained, it does not collapse in the shape of cotton and a crack does not occur easily in mold, casting defects, such as a flash, do not generate the heated ring liner on a casting object. And the result of having examined wholeheartedly the ring liner from which the compatibility to the defective bridge abutment part of a casting restoration object also becomes good, The glass component which carries out softening sintering at 400-700 degrees C, and serves as a matrix of ceramic fiber or inorganic fine particles is added to ceramic fiber and the inorganic fine particles which have the thermal resistance of 1000 degrees C or more currently used from the former, When asbestos paper has by using together the inorganic binder which demonstrates adhesive strength at the temperature of 200 degrees C or more which an organic binder pyrolyzes, and the organic binder which demonstrates adhesive strength in ordinary temperature, and [ same ] The ring liner which it has moderate buffer action, and the expansion at the time of mold coagulation and heating is not controlled [ liner ], but it moreover has [ liner ] moderate reinforcement, and does not generate a flash was found out, and this invention was completed.

[0012] That is, moreover the ring liner which this invention added the inorganic binder and the synthetic-resin emulsion at inorganic powder, such as ceramic fiber of the quality of alumina silicate which has the thermal resistance of 1000 degrees C or more, a glass fiber, and alumina powder, and was sheet-ized did not make a casting object generate casting defects, such as a flash, excluding asbestos at all, but its compatibility to a bridge abutment part was also good.

[0013] To the reason there is also no generating of a flash and the good casting restoration object of compatibility is obtained by the ring liner by this invention, in case mold material solidifies first at the time of a room temperature, since it has moderate tensile strength with ceramic fiber, a glass fiber, the moderate cushioning properties by inorganic fine particles, and an organic binder, setting expansion is not controlled.

[0014] Furthermore, in case the pattern which consists the solidified mold of the wax buried in mold or resin is incinerated, thermal expansion of mold is not controlled and a crack does not occur in mold according to the effectiveness of an inorganic binder of moreover having the effectiveness of adhesive strength above 200 degrees C.

[0015] The glass fiber of this invention is softened below 700 degrees C, and although 573 degrees C of heat temperature of transformation of the quartz contained in mold material or the cristobalite aggregate, i.e., a quartz, and 200-300 degrees C of cristobalites show big expansion, the role which gives moderate buffer action and reinforcement to the big expansion by the heat transformation of the aggregate is shown. For example, soda glass, phosphate glass, borate glass, etc. are used.

[0016] Furthermore, if it said, in order that the quartz and Cousteau Bala Ito's heat temperature of transformation which are contained in mold material might show the expansion at about 200-300 degrees C with big 573 degrees C and cristobalite with a quartz, 200 degrees C or less of 200 degrees C or more of things for which it has moderate reinforcement according to the effectiveness of an inorganic binder became possible according to the effectiveness of an organic binder.

[0017] In order not to control expansion of room temperature -200 degree C but to obtain moderate reinforcement, the suitable loadings of acrylic resin or the organic binder of a vinyl-acetate-resin system are 5 - 15 weight section. Moreover, in order not to control expansion of 200 degrees C or more but to obtain moderate reinforcement, the suitable loadings of the inorganic binder of alumina sol or a silica sol system are under 1 - 10 weight section. In under the organic binder 5 weight section and under the inorganic binder 1 weight section, casting defects, such as a flash, occur with the lack of on the strength, and a bad influence is done also to compatibility. More than the organic binder 20 weight section, above the inorganic binder 18 weight section, reinforcement is too large, cushioning properties are lost, expansion of mold is controlled, and compatibility serves as a defect to the bridge abutment part of a casting object. The reason for blending the inorganic fine particles represented by alumina powder is for taking out the feel of asbestos paper, and 10 - 40 weight section is suitable for it.

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**EXAMPLE**

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[Example] An example explains this invention concretely below.

The example 1 - 3 ceramic fiber (Nippon Steel chemistry SC-1260R) 35 weight section, the aluminum powder 25 weight section, the glass fiber 25 weight section, and the kraft pulp (NBXP) 15 weight section are disaggregated underwater. The silica sol 2.5 weight section (solid content), acrylic resin (Toagosei PDLA-160WR) 5 - 15 weight sections (solid content), and the denaturation silicone emulsion 1 weight section (active principle) were added to this, and the polymer coagulant was added further, and by the usual approach, paper making was carried out, it dried, and the 0.7mm sheet was obtained. (G C company make, trade name new casting liner)

[0022] The example 4 - 6 ceramic fiber 50 weight section, the alumina powder 25 weight section, and the glass fiber 25 weight section are disaggregated underwater. this -- alumina sol 1 - 10 weight sections (solid content), the vinyl-acetate-resin 10 weight section, and the denaturation silicone emulsion 1 weight section (active principle) -- adding -- further -- a polymer coagulant -- adding -- the usual approach -- paper making -- it dried and the 0.7mm sheet was obtained. (G C company make, trade name new casting liner)

[0023] After it cut the sheet of 0.7mm thickness in die length of 50mm, and width of face of 25mm and the tensile strength of a ring liner heated it at the time of a room temperature, and 700 degrees C, it cooled to the room temperature and it was measured with the tension tester. After the flash generating trial fixed to the truncated cone the casting ring which stood the ready-made crown mold wax pattern erect in the truncated cone, and carried out the lining of the ring liner and embedded the pattern at mold material, heating incineration was carried out at 700 degrees C, dental gold-silver-palladium alloys (trade-name cast well MC 12: \*\*\*\* dentistry industrial company make) were cast, it cooled to the room temperature, and it was taken out from mold, and observed the existence of weld flash generating visually. In addition, mold material adjusted and used what mixed 30 % of the weight of alpha-hemihydrate plaster of 70 % of the weight and 15 micrometers of mean diameters by the mixing water ratio 0.33 in the coulisse baryta powder end of 10 micrometers of mean diameters.

[0024] the full crown mold and MOD inlay mold whose compatibility is in A.D.A specification No.2 -- using -- a dentistry artisan's connoisseur -- after having produced the wax pattern by the method, casting in the same approach as a flash generating trial and picking out a casting object from mold, it returned to the pattern and gazed at the good of compatibility, and a defect by the degree of a gap with a pattern.

[0025]

[Table 1]

		組 成 (重量部)	リングライニング材の引張強度 kg/25mm幅		錆バリ発生 の有無	適合性
			常 温 時	700℃ 加 熱 後		
実 施 例	1	セラミック繊維 35 アルミナ粉末 25 ガラス繊維 25 クラフトパルプ 15 シリカゾル 2.5 変性シリコン 1 アクリル樹脂 5	1.5	0.5	無	良 好
	2	アクリル樹脂 10 他は1に同じ	3.0	0.4	無	良 好
	3	アクリル樹脂 15 他は1に同じ	4.5	0.3	無	良 好
	4	セラミック繊維 50 アルミナ粉末 25 ガラス繊維 25 アルミナゾル 1 酢ビ 10 変性シリコン 1	2.0	0.3	無	良 好
	5	アルミナゾル 5 他は4に同じ	2.5	1.0	無	良 好
	6	アルミナゾル 10 他は4に同じ	3.0	1.5	無	良 好
比 較 例	1	セラミック繊維 90 碎木パルプ 10	4.0	綿状にくずれ 測定不可能	有	不 良
	2	セラミック繊維 65 アルミナ粉末 20 セミケミカルパルプ 10 SBR 5	4.5	綿状にくずれ 測定不可能	有	不 良

[Translation done.]

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(54)【発明の名称】 歯科鑄造用リングライニング材

(57)【要約】

【目的】 アスベストを含まないにも拘わらず、室温時や加熱時に適度な柔軟性と緩衝作用及び強度を有し、鑄造体に鑄バリ等の鑄造欠陥を発生せず、更に鑄造修復物の欠損支台部分への適合物の良好な歯科鑄造用リングライニング材。

【構成】 1000°C以上の耐熱性を有する無機繊維とガラス繊維と無機粉体とを主成分とし、無機バインダーと有機バインダーで結着してシートに成形することを特徴とする。



## 【特許請求の範囲】

【請求項1】 1000℃以上の耐熱性を有する無機繊維とガラス繊維と無機粉体とを主成分とし、無機バインダーと有機バインダーで結着し、シートに成形して成ることを特徴とする歯科鑄造用リングライニング材。

【請求項2】 該無機バインダーがアルミナゾル及び／またはシリカゾルと該有機バインダーが合成樹脂エマルジョン及び変性シリコン樹脂エマルジョンで構成される請求項1に記載の歯科鑄造用リングライニング材。

【請求項3】 1000℃以上の耐熱性を有する無機繊維とガラス繊維と無機粉体とを主成分として配合、水中で離解混合したものに無機バインダーと有機バインダーとを混合し、所定の厚さに抄造、脱水、乾燥してシートに成形して成ることを特徴とする歯科鑄造用リングライニン

## 【詳細な説明】

## 1]

【利用分野】本発明は、歯科鑄造に於いて、鑄グの内側に裏装して用いる歯科鑄造用リングライニング材に関するものである。

## 2]

【技術】歯科鑄造に用いられる短冊状のリングライニング材は鑄造修復物を口腔内の実質欠損部分に正確に適合させるために溶湯が鑄込まれ、室温にまで冷却される際の収縮を補償すべく歯科用鑄型材の凝結膨張や収縮を抑制せず、クッション材として歯科鑄造用リングの内側に裏装して使用される。この様な目的で用いられるリングライニング材を歯科に於いて鑄造用緩衝材または用リライニング材と称されているものである。

【0003】従来リングライニング材はアスベストを主成分とするアスベスト紙が用いられ、最近になって一部セラミック繊維を主成分とするセラミック紙が用いられる様になった。

## 【0004】

【発明が解決しようとする課題】近年アスベストは発癌性があるとのことでアメリカ国内に於いては建築材料へのアスベストの使用を禁止しており、日本に於いても規制する等、社会問題となっている。歯科に於いてもアスベストに代わる材料への要望が高まって来ている。

【0005】一方アスベストを主成分としたリングライニング材の代替用として、アルミナシリケート質の繊維を主成分としたセラミック繊維系のリングライニング材が市販されている。このセラミック繊維系のリングライニング材はセラミック繊維を主成分とし、アクリル樹脂等の合成樹脂または天然バンプをバインダーとしている。

【0006】この様なセラミック繊維系のリングライニング材は、歯科で用いるに十分なクッション性を有しており、鑄型材の凝結時の膨張や加熱時の膨張を抑制することは無いものの、鑄造用リング内の加熱されたリング

ライニング材は綿状に崩れ、鑄造用リングがあるにも拘わらず、宛かもリングレス鑄造の状態を示す。即ち鑄型中に容易に亀裂が発生し、鑄造欠陥を発生させる。この鑄造欠陥は欠損支台部分への適合性にも悪影響を与える。

【0007】即ち、歯科でう蝕で罹患した歯（虫歯）や脱落した歯を修復する場合に合金を鑄造して、インレー、クラウン等を作成する。鑄造に際してはロストワックス法と呼ばれる精密鑄造法が用いられる。精度が悪いと、鑄造したインレーやクラウンを患者の歯に確実に装着することができないためである。

【0008】しかしながらロストワックス法でも歯科用合金は鑄型の中で凝固した後常温に冷却されるまでの間に1.5～2.3%程度収縮するので、鑄型材は凝結中及び加熱中に鑄造合金の収縮を補償するだけの膨張をすることが必要である。合金の溶湯を鑄込む際の鑄型はワックスパターンの寸法よりも1.5～2.3%程度大き目になっていることが必要で、このため鑄型材は凝結膨張と熱膨張するようになっている。鑄型材は鑄造リングの中にワックスで形成したパターンを埋没させ鑄型材を凝結後に電気炉内で加熱脱ろうして鑄型を形成する。

【0009】従って鑄造用リングの内周面に鑄型材の膨張を吸収するリングライニング材を設けている。このリングライニング材は、鑄造用リングの内周面に短冊状にて裏装している。そのため鑄造用リングにフィットすること、鑄型材の凝結時の膨張や加熱時の膨張を吸収すること、加熱されたリングライニング材はシート状を維持し綿状に崩れないことが要求される。また、リングライニング材は鑄型材の吸水膨張による膨張のバラツキを無くするために水分を吸収することの無いよう撥水性が必要である。

【0010】しかしながら、上記セラミックス繊維を主成分とし、合成樹脂または天然バンプをバインダーとしたものは、鑄型材の膨張を抑制することはないものの、鑄造リング内周面へのフィット性、加熱されたリングライニング材が綿状に崩れ鑄型中に容易に亀裂が発生し、鑄造欠陥を発生或いは鑄型材の水分がリングライニング材に吸収され鑄型材の膨張のバラツキが発生する等の問題があった。

## 【0011】

【問題点を解決するための手段】本発明はアスベストを全く含有せず、鑄型材の水分を吸収すること無く、鑄造リング内周面に短冊シートがフィットし鑄型材の凝結時の膨張や加熱時の膨張を吸収すること、加熱されたリングライニング材は、シート状を維持し綿状に崩れず鑄型中に容易に亀裂が発生しないことにより鑄造体に鑄バリ等の鑄造欠陥が発生せず、しかも鑄造修復物の欠損支台部分への適合性も良好となるリングライニング材を鋭意検討した結果、従来から使用されている1000℃以上の耐熱性を有するセラミック繊維や無機粉体に400～700℃で

軟化焼結し、セラミック繊維や無機粉体のマトリックスとなるガラス成分を加えること、及び有機バインダーが熱分解する200℃以上の温度で接着力を発揮する無機バインダーと常温で接着力を発揮する有機バインダーを併用することによってアスベスト紙が有すると同様な、適度な緩衝作用を有し、鑄型凝結時や加熱時の膨張を抑制せず、しかも適度な強度を有して鑄バリを発生させないリングライニング材を見出し、本発明を完成した。

【0012】即ち、本発明は1000℃以上の耐熱性を有するアルミナシリケート質のセラミックス繊維とガラス繊維とアルミナ粉末等の無機粉末に、無機バインダーと合成樹脂エマルジョンを加え、シート化したリングライニング材はアスベストを全く含まず、しかも鑄造体には鑄バリ等の鑄造欠陥を発生させず、支台部分への適合性も良好であった。

【0013】本発明によるリングライニング材により、鑄バリの発生も無く適合性の良好な鑄造修復物が得られる理由には、先ず室温時に鑄型材が凝結する際、セラミック繊維とガラス繊維と無機粉体による適度なクッション性と有機バインダーによる適度な引張強度を有するため凝結膨張を抑制しない。

【0014】更にその凝結した鑄型を、鑄型内に埋没されているワックスやレジンから成るパターンを焼却する際、鑄型の熱膨張を抑制せず、しかも200℃以上で接着力の効果を有する無機バインダーの効果により鑄型に亀裂が発生することが無い。

【0015】本発明のガラス繊維は700℃以下で軟化し、鑄型材に含有される石英やクリストバライト骨材の熱変態温度、即ち石英573℃とクリストバライト200～300℃で大きな膨張を示すが、骨材の熱変態による大きな膨張に対して適度な緩衝作用と強度を与える役割を示す。例えばソーダガラス、リン酸塩ガラス、ホウ酸塩ガラス等を使用する。

【0016】更に云えば鑄型材に含有されている石英やクリストバライトの熱変態温度が石英で573℃、クリストバライトが約200～300℃で大きな膨張を示すため、200℃以下は有機バインダーの効果により、200℃以上は無機バインダーの効果により、適度な強度を有することが可能になった。

【0017】室温～200℃の膨張を抑制せず適度な強度を得るためにアクリル樹脂または酢酸ビニル樹脂系の有機バインダーの適切な配合量は5～15重量部である。また200℃以上の膨張を抑制せず適度な強度を得るためにアルミナゾルまたはシリカゾル系の無機バインダーの適切な配合量は1～10重量部未満である。有機バインダー5重量部未満、無機バインダー1重量部未満では、強度不足により鑄バリ等の鑄造欠陥が発生し、適合性へも悪影響を及ぼす。有機バインダー20重量部以上、無機バインダー18重量部以上では強度が大き過ぎてクッション性が無くなり鑄型の膨張を抑制し、鑄造体の支台部分へ適

合性が不良となる。アルミナ粉末に代表される無機粉体を配合する理由はアスベスト紙の感触を出すためであり、10～40重量部が適切である。

【0018】尚、本発明の1000℃以上の耐熱性を有する無機繊維としては通常用いられている $Al_2O_3/SiO_2$ の重量比が0.4～0.6のセラミックス繊維の他、アルミナ繊維、ジルコニア繊維、シラス繊維、チタン酸カリウム繊維を用いることができ、適切な配合量は30～60重量部である。またガラス繊維の適切な配合量は10～50重量部である。また従来から使用されている天然パルプを混抄することも抄紙の作業性を向上させる。

【0019】更に、リングライニング材の吸水性をコントロールするため、変性シリコン樹脂を有機バインダーの一部に加えることにより鑄造体の膨張の再現性が良くなり、支台部への適合性に好結果を得た。

【0020】更に、バインダーの付着方法としてピータサイズ法と含浸方法とがあるが、両者共リングライニング材としての効果に差は無いものの鑄造用リングへの装着の作業性に就いて前者の方が優れていた。即ちピータサイズ法によってバインダーを付着させた場合は樹脂のマイグレーションが起こらず、リングライニング紙を柔軟に仕上げるため、リングへの装着時に折れが無く、スムーズに装着が可能であった。

【0021】

【実施例】以下実施例により本発明を具体的に説明する。

実施例1～3

セラミックス繊維(新日鉄化学 SC-1260R)35重量部、アルミ粉末25重量部、ガラス繊維25重量部、クラフトパルプ(NBXP)15重量部を水中で離解する。これにシリカゾル2.5重量部(固形分)、アクリル樹脂(東亜合成 PDLA-160WR)5～15重量部(固形分)、変性シリコンエマルジョン1重量部(有効成分)を加え、更に高分子凝集剤を加え、通常の方法で抄紙し、乾燥して0.7mmのシートを得た。(ジーシー社製、商品名ニューキャストリングライナー)

【0022】実施例4～6

セラミックス繊維50重量部、アルミナ粉末25重量部、ガラス繊維25重量部、を水中で離解する。これにアルミナゾル1～10重量部(固形分)、酢酸ビニル樹脂10重量部、変性シリコンエマルジョン1重量部(有効成分)を加え、更に高分子凝集剤を加え、通常の方法で抄紙、乾燥し0.7mmのシートを得た。(ジーシー社製、商品名ニューキャストリングライナー)

【0023】リングライニング材の引張強さは0.7mm厚のシートを長さ50mm、幅25mmに切断し室温時と700℃に加熱した後、室温まで冷却して引張試験機にて測定した。鑄バリ発生試験は既製のクラウン型ワックスパターンを円錐台に植立しリングライニング材を裏装した鑄造用リングを円錐台に固定しパターンを鑄型材に埋入した

後、700℃で加熱焼却し歯科用金銀パラジウム合金（商品名キャストウェルMC12：而至歯科工業社製）を鑄造し室温まで冷却して鑄型より取り出しバリ発生の有無を目視にて観察した。尚鑄型材は平均粒径10μmのクリスパライト粉末70重量%と平均粒径15μmのα半水石膏30重量%を混水比0.33で混合したものを調整して使用した。

【0024】適合性はA。D。A規格No.2にあるフル \*

\* クラウン型及びMODインレー型を用い歯科技工の通法によりワックスパターンを作製し鑄バリ発生試験と同様の方法で鑄造し鑄造体を鑄型から取り出した後、原型に戻し原型との間隙の度合により適合性の良、不良を観察した。

【0025】

【表1】

		組 成 (重量部)	リングライニング材の引張強度 kg/25mm幅		鑄バリ発生 の有無	適合性
			常 温 時	700℃ 加 熱 後		
実 施 例	1	セラミック繊維 35 アルミナ粉末 25 ガラス繊維 25 クラフトバルブ 15 シリカゾル 2.5 変性シリコン 1 アクリル樹脂 5	1.5	0.5	無	良 好
	2	アクリル樹脂 10 他は1に同じ	3.0	0.4	無	良 好
	3	アクリル樹脂 15 他は1に同じ	4.5	0.3	無	良 好
	4	セラミック繊維 50 アルミナ粉末 25 ガラス繊維 25 アルミナゾル 1 酢ビ 10 変性シリコン 1	2.0	0.3	無	良 好
	5	アルミナゾル 5 他は4に同じ	2.5	1.0	無	良 好
	6	アルミナゾル 10 他は4に同じ	3.0	1.5	無	良 好
比 較 例	1	セラミック繊維 90 碎木バルブ 10	4.0	線状にくずれ 測定不可能	有	不 良
	2	セラミック繊維 65 アルミナ粉末 20 セメシカルバルブ 10 SBR 5	4.5	線状にくずれ 測定不可能	有	不 良

【0026】

【発明の効果】表1から明らかな如く、無機バインダーと有機バインダーを併用したリングライニング材はアスベストを含まないにも拘わらず室温時や加熱時に適度な柔軟性と緩衝作用及び強度を有しており、鑄造体に鑄バ\*

※リ等の鑄造欠陥が発生せず更に鑄造修復物の欠損支台部分への適合性も良好であり、実施例の何れの場合に於いても比較例より優れ、歯科鑄造用リングライニング材に要求される性能が向上していることが判明した。

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